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Smooth values of polynomials and superirreducibility

We discuss k -superirreducible polynomials, by which we mean irreducible polynomials that remain irreducible under any polynomial substitution of positive degree at most k . The existence of superirreducible polynomials with integral coefficients places constraints on potential approaches to generating smooth values of polynomials (values having only small prime factors), a topic investigated by Schinzel in 1967. We describe the motivation and background to such considerations, and report on recent work restricted to finite fields. In particular, we give an explicit formula for the number of monic 2-superirreducible polynomials having even degree d analogous to the famous formula of Gauss for the number of monic irreducible polynomials of given degree over a finite field. This talk is based on joint work of the speaker with Jonathan Bober, Lara Du, Dan Fretwell, Gene Kopp and Greg Martin.